Towards functional markers for apple aroma - Assessment of allelic diversity in members of the lipoxygenase (LOX) gene family

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At the NWF 2010 the background and the major aims of the project were presented together with first results on bioinformatic LOX (lipoxygenase) gene mining. In the forthcoming presentation, a comprehensive phylogenetic tree of the apple LOX gene family will be displayed, that proves the determination of sequences as genes and indicates different alleles. Furthermore, an overview about the so far from *Malus* cloned series of LOX genes is given, and the strategy for direct sequencing and evaluation of the allelic state of selected LOX genes is demonstrated.

In the past, it was a laborious and expensive task to sequence large sets of gene-specific amplicons produced by specific primers in different cultivars and to obtain sufficient information concerning the allelic diversity of a putative candidate gene. Thus, fragment length analyses of simple sequence repeat (SSR) arrays were used for association analyses, but because of much lower frequency of loci they have lower information content, compared with single nucleotide polymorphisms (SNPs), which are an abundant source of molecular variation in a plant genome. Nowadays, it is possible to use sequence data from databanks, to create gene specific primers instead of degenerate primers. Especially for larger gene families, such as LOX, highly specific PCR primers are crucial for achieving accurate sequencing results from a heterozygous plant like apple. After sequencing the PCR fragments of chosen LOX members in 29 apple cultivars with available aroma profiles, several putative SNPs have been identified. These allelic data will further be used for association analyses of LOX genes and their alleles which might be involved in volatile organic compound (VOC) production in apple. The final goal of the reported investigation is to develop SNP-based functional marker assays that can be used for marker assisted selection of fruit quality traits in young apple seedlings.